

TABLE E-3
SURFACE WATER TOXICITY REFERENCE VALUES

| Constituent | Regulatory or Toxicity Value | | Uncertainty Factor ^b | Toxicity Reference Value (TRV) ^c | Reference and Explanation ^d |
|---------------------------------------------------------------------------|---------------------------------------------|---------------|---------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Duration and Endpoint ^a | Concentration | | | |
| Dioxins and furans (Φg/L) | | | | | |
| 2,3,7,8-TCDD (compare to 2,3,7,8-TCDD toxicity equivalence concentration) | Chronic lowest observed effect level (LOEL) | 0.000038 | 0.1 | 0.0000038 | Mehrle, Buckler, Little, Smith, Petty, Peterman, Stalling, De Graeve, Coyle, and Adams (1988). 2,3,7,8-TCDD toxicity value for rainbow trout (<i>Oncorhynchus mykiss</i>). |
| Polycyclic aromatic hydrocarbons (PAH) (Φg/L) | | | | | |
| Total high molecular weight PAHs | -- | -- | -- | 0.014 | Benzo(a) pyrene toxicity used as surrogate measure of toxicity. This TRV should be used if assessing the risk of total HMW PAHs. |
| Benzo(a)pyrene | Tier II secondary chronic value (SCV) | 0.014 | Not applicable | 0.014 | U.S. EPA (1996). |
| Benzo(a)anthracene | Tier II SCV | 0.027 | Not applicable | 0.027 | Suter and Tsao (1996). |
| Benzo(b)fluoranthene | -- | -- | -- | 0.027 | No regulatory or toxicity value available. Benzo(a)anthracene used as surrogate. |
| Benzo(k)fluoranthene | -- | -- | -- | 0.027 | No regulatory or toxicity value available. Benzo(a)anthracene used as surrogate. |
| Chrysene | -- | -- | -- | 0.027 | No regulatory or toxicity value available. Benzo(a)anthracene used as surrogate. |
| Dibenz(a,h)anthracene | -- | -- | -- | 0.027 | No regulatory or toxicity value available. Benzo(a)anthracene used as surrogate. |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | 0.027 | No regulatory or toxicity value available. Benzo(a)anthracene used as surrogate. |

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| Polychlorinated biphenyls (PCB) (Φg/L) | | | | | |
| Aroclor 1016 | -- | 0.19 | Not applicable | 0.19 | Adopted from U.S. EPA (1996) value for Total PCB. Calculated using Great Lakes Water Quality Initiative Tier II methodology. |
| Aroclor 1254 | -- | 0.19 | Not applicable | 0.19 | Adopted from U.S. EPA (1996) value for Total PCB. Calculated using Great Lakes Water Quality Initiative Tier II methodology. |
| Nitroaromatics (Φg/L) | | | | | |
| 1,3-Dinitrobenzene | Subchronic (5-day) NOEC for growth | 260 | 0.1 | 26 | van der Schalie (1983). Algal growth test with <i>Selenastrum capricornutum</i> . |
| 2,4-Dinitrotoluene | Chronic LOEL | 230 | 0.1 | 23 | U.S. EPA (1994b). |
| 2,6-Dinitrotoluene | Chronic NOEC | 60 | Not applicable | 60 | Kuhn, Pattard, Pernak, and Winter (1989). Toxicity value for water flea (<i>Daphnia magna</i>). |
| Nitrobenzene | Acute LOEL | 27,000 | 0.01 ^e | 270 | U.S. EPA (1994b). |
| Pentachloronitrobenzene | Acute (24-hour) LC50 | 1,000 | 0.01 | 10 | Hashimoto and Nishiuchi (1981). Toxicity value for common carp (<i>Cyprinus carpio</i>). |
| 2,4,6-Trinitrotoluene (TNT) | Final Chronic Value (FCV) | 90 | 0.1 | 9.0 | This value is the Chronic Water Quality Criterion for chronic exposures calculated by Oak Ridge National Laboratory, as cited in (Talmage and others (1999). |
| Phthalate esters (Φg/L) | | | | | |
| Bis(2-ethylhexyl)phthalate | Tier II SCV | 3.0 | Not applicable | 3.0 | Suter and Tsao (1996). |

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| Di-n-butylphthalate | Chronic criterion | 9.4 | Not applicable | 9.4 | This value was adopted by U.S. EPA Region 4 as a screening level value for hazardous waste sites, and represents the lowest reported effect level with an uncertainty factor of ten applied to protect more sensitive species (U.S. EPA 2000). |
| Diethylphthalate | Chronic criterion | 521 | Not applicable | 521 | This value was adopted by U.S. EPA Region 4 as a screening level value for hazardous waste sites, and represents the lowest reported effect level with an uncertainty factor of ten applied to protect more sensitive species (U.S. EPA 2000). |
| Di(n)octyl phthalate | Chronic no observed effect level (NOEL) | 320 | Not applicable | 320 | McCarthy and Whitmore (1985). Toxicity value for water flea (<i>D. magna</i>). |
| Volatile organic compounds (Φg/L) | | | | | |
| Acetone | Tier II SCV | 1,500 | Not applicable | 1,500 | Suter and Tsao (1996). |
| Acrylonitrile | Chronic LOEL | 2,600 | 0.1 | 260 | U.S. EPA (1994b). |
| Bromoform | Chronic Criterion | 293 | Not applicable | 293 | This value was adopted by U.S. EPA Region 4 as a screening level value for hazardous waste sites, and represents the lowest reported effect level with an uncertainty factor of ten applied to protect more sensitive species (U.S. EPA 2000). |
| Chloroform | Tier II SCV | 28 | Not applicable | 28 | Suter and Tsao (1996). |
| Crotonaldehyde | Acute (96-hour) LC50 | 3,500 | 0.01 | 35 | Dawson, Jennings, Drozdowski, and Rider (1977). Toxicity value for bluegill sunfish (<i>Lepomis macrochirus</i>). |
| 1,4-Dioxane | Acute effective concentration zero percent (EC0) | 6,210,000 | 0.01 | 62,100 | Bringmann and Kühn (1982). Toxicity value for water flea (<i>D. magna</i>). |

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| | Duration and Endpoint ^a | Concentration | | | |
| Ethylbenzene | Chronic criterion | 453 | Not applicable | 453 | This value was adopted by U.S. EPA Region 4 as a screening level value for hazardous waste sites, and represents the lowest reported effect level with an uncertainty factor of ten applied to protect more sensitive species (U.S. EPA 2000). |
| Formaldehyde | Acute LC50 | 4,960 | 0.01 | 49.6 | Reardon and Harrell (1990). No data available for formadehyde. Formalin containing 37 percent formaldehyde is used as a surrogate. Endpoint based on formaldehyde concentration. |
| n-Hexane | Tier II SCV | 0.58 | Not applicable | 0.58 | Suter and Tsao (1996). |
| 1,1,2,2-Tetrachloroethane | Chronic criterion | 240 | Not applicable | 240 | This value was adopted by U.S. EPA Region 4 as a screening level value for hazardous waste sites, and represents the lowest reported effect level with an uncertainty factor of ten applied to protect more sensitive species (U.S. EPA 2000). |
| Vinyl chloride | Subchronic (10-day) LC100 for single tested concentration | 388,000 | 0.01 ^e | 3,880 | Brown, Sinclair, Keith, Beamer, Hazdra, Nair, and Callaghan (1977). |
| Semi-volatile organic compounds (Φg/L) | | | | | |
| Benzoic acid | Tier II SCV | 42 | Not applicable | 42 | Suter and Tsao (1996). |
| Benzyl alcohol | Tier II SCV | 8.6 | Not applicable | 8.6 | Suter and Tsao (1996). |
| Inorganics (mg/L) ^f | | | | | |
| Aluminum | Final chronic value (FCV) | 0.087 | Not applicable | 0.087 | U.S. EPA (1988). |
| Antimony | Proposed chronic criterion | 0.003 | Not applicable | 0.003 | U.S. EPA (1994b). |

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| | Duration and Endpoint ^a | Concentration | | | |
| Arsenic (trivalent) | Chronic criterion | 0.19 | Not applicable | 0.19 | U.S. EPA (1994b). |
| Barium | Tier II SCV | 0.004 | Not applicable | 0.004 | Suter and Tsao (1996). |
| Beryllium | Tier II SCV | 0.00066 | Not applicable | 0.00066 | Suter and Tsao (1996). |
| Boron | Chronic criterion | 750 | Not applicable | 750 | This value is the National Ambient Water Quality Criteria (NAWQC) for chronic exposures (U.S. EPA 1995) and was cited in Friday (1998). |
| Cadmium | Chronic criterion | 0.0010 | Not applicable | 0.0010 | U.S. EPA (1994b). Criterion is hardness-dependent. Water hardness of 100 mg/L (as calcium carbonate) used to compute criterion: $e^{(0.7852 * \ln \text{hardness})} \leq 3.490$. Criterion converted to dissolved concentration using conversion factor of 0.909 (U.S. EPA 1996). |
| Chromium (hexavalent) | FCV | 0.010 | Not applicable | 0.010 | (U.S. EPA 1996). Residue data excluded from calculation of FCV because human fish consumption not relevant to SLERAP. |
| Copper | Chronic criterion | 0.011 | Not applicable | 0.011 | U.S. EPA (1994b). Criterion is hardness-dependent. Water hardness of 100 mg/L (as calcium carbonate) used to compute criterion: $e^{(0.8545 * \ln \text{hardness})} \leq 1.465$. Criterion converted to dissolved concentration using conversion factor of 0.960 (U.S. EPA 1996). |
| Total Cyanide | Chronic criterion | 0.0052 | Not applicable | 0.0052 | U.S. EPA (1994b). |
| Lead | Chronic criterion | 0.0025 | Not applicable | 0.0025 | U.S. EPA (1994b). Criterion is hardness-dependent. Water hardness of 100 mg/L (as calcium carbonate) used to compute criterion: $e^{(1.273 * \ln \text{hardness})} \leq 4.705$. Criterion converted to dissolved concentration using conversion factor of 0.791 (U.S. EPA 1996). |

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| | Duration and Endpoint ^a | Concentration | | | |
| Mercury (inorganic) | FCV | 0.0013 | Not applicable | 0.0013 | U.S. EPA (1996). Residue data excluded from calculation of FCV because human fish consumption not relevant to SLERAP. |
| Methyl mercury | Tier II SCV | 0.0000028 | Not applicable | 0.0000028 | Suter and Tsao (1996). |
| Nickel | Chronic criterion | 0.160 | Not applicable | 0.160 | U.S. EPA (1994b). Criterion is hardness-dependent. Water hardness of 100 mg/L (as calcium carbonate) used to compute criterion: $e^{(0.8460 * \ln \text{hardness}) + 1.1645}$. Criterion converted to dissolved concentration using conversion factor of 0.997 (U.S. EPA 1996). |
| Selenium | Chronic criterion | 0.005 | Not applicable | 0.005 | U.S. EPA (1994b) |
| Silver | Proposed chronic criterion | 0.00012 | Not applicable | 0.00012 | U.S. EPA (1994b). |
| Thallium | Chronic LOEL | 0.04 | 0.1 | 0.004 | U.S. EPA (1994b). |
| Zinc | Chronic criterion | 0.110 | Not applicable | 0.110 | U.S. EPA (1994b). Criterion is hardness-dependent. Water hardness of 100 mg/L (as calcium carbonate) used to compute criterion: $e^{(0.8473 * \ln \text{hardness}) + 0.7614}$. Criterion converted to dissolved concentration using conversion factor of 0.986 (U.S. EPA 1996). |
| Other compounds (mg/L) ^f | | | | | |
| Cyclotrinitramine-methylene (RDX) | SCV | 190 | Not applicable | 190 | This value is the SCV for chronic exposures (Talmage and others 1999) and was calculated according to U.S. EPA guidance for the Great Lakes System (U.S. EPA 1993). |
| Decane | Tier II SCV | 49 | Not applicable | 49 | This value is the SCV for chronic exposures (Suter and Tsao 1996) and is cited by Friday (1998). |
| GB (Sarin) | -- | -- | -- | -- | Screening or toxicity value not available. |

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| | Duration and Endpoint ^a | Concentration | | | |
| VX | -- | -- | -- | -- | Screening or toxicity value not available. |
| Sulfur mustard | -- | -- | -- | -- | Screening or toxicity value not available. |

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Notes:

- a The duration of exposure is defined as chronic if it represents about 10 percent or more of the test animals lifetime expectancy. Acute exposures represent single exposures or multiple exposures occurring within a short time. For evaluating exposure duration, the following general guidelines were used. For invertebrates and other lower trophic level aquatic biota: (1) chronic duration lasted for 7 or more days, (2) subchronic duration lasted from 3 to 6 days, and (3) acute duration lasted 2 days or less. For fish: (1) chronic duration lasted for more than 90 days, (2) subchronic duration lasted from 14 to 90 days, and (3) acute duration lasted less than 2 weeks.
 - b Uncertainty factors are used to extrapolate a toxicity value to a chronic NOAEL TRV.
 - c TRV was calculated by multiplying the regulatory or toxicity value with the uncertainty factor.
 - d The references refer to the source of the regulatory or toxicity value. Complete reference citations are provided at the end of this appendix.
 - e Best professional judgment used to identify uncertainty factor. Factors evaluated include test duration, ecological relevance of endpoint, experimental design, and availability of toxicity data.
 - f TRVs for metals are based on the dissolved metal concentration. According to U.S. EPA policy, concentrations of dissolved metal more closely approximate the bioavailable fraction of metal in the water column (U.S. EPA 1993).
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